

REMARKS

By this amendment, claims 1, 11, 13, and 19 have been amended, and claims 2-7, 14-15, and 20-23 and have been canceled without prejudice or disclaimer. Claim 24 has been withdrawn from further consideration. Accordingly, claims 1, 8-13, and 16-19 are currently pending in the application, of which claims 1 and 13 are independent claims.

Applicants respectfully submit that the above amendments do not add new matter to the application and are fully supported by the specification. Support for the amendments may be found at least in Figures 2 and 3; at page 5, line 20 through page 6, line 10, at page page 7, line 8 through page 8, line 18 of the specification; and original claims 2, 7, 14, and 15.

Applicants respectfully request reconsideration and timely withdrawal of the pending objections and rejections for the reasons discussed below.

Claim Objection

In the Office Action, claim 11 was objected to because it depends from claim 6, but claim 11 is a duplicate claim of claim 6.

Claim 11 has been amended to depend from claim 10. This amendment is made for the sole purpose of clarification. This amendment is not made for the purpose of avoiding prior art or narrowing the claimed invention. Therefore Applicants do not intend to relinquish any subject matter by these amendments. Applicants respectfully submit that claim 11, as amended, overcomes the stated objection. Accordingly, Applicants respectfully request withdrawal of the objection for claim 11.

Rejections Under 35 U.S.C. § 112, 2nd Paragraph

Claims 6, 19, and 23 stand rejected under 35 U.S.C. § 112 as being indefinite.

Claim 19 has been amended to replace “wide bandgap organic semiconductor” with “hole barrier layer”. This amendment is made for the sole purpose of clarification. This amendment is not made for the purpose of avoiding prior art or narrowing the claimed invention, and no change in claim scope is intended. Therefore, Applicants do not intend to relinquish any subject matter by these amendments. Applicants respectfully submit that claim 19, as amended, fully comply with the requirements of 35 U.S.C. § 112, second paragraph.

Claims 6 and 23 have been canceled.

Accordingly, Applicants respectfully request withdrawal of the 35 U.S.C. § 112, second paragraph rejection of claims 6, 19, and 23.

Rejections Under 35 U.S.C. § 102

Claims 1-23 stand rejected under 35 U.S.C. § 102(e) as being allegedly anticipated by PCT Patent Publication No. WO 03/022008 A1 applied for by Thompson, *et al.* (“WO 03/022008 A1”).

In order for a rejection under 35 U.S.C. § 102(e) to be proper, a single reference must disclose every claimed feature. To be patentable, a claim need only recite a single novel feature that is not disclosed in the cited reference. Thus, the failure of a cited reference to disclose one or more claimed features renders the 35 U.S.C. § 102(e) rejection improper.

Applicants respectfully submit that the rejection of independent claims 1 and 13 must be withdrawn because Thompson fails to disclose each and every claimed feature of independent claims 1 and 13.

Claims 1 and 8-12

Specifically, claim 1, as amended, recites *inter alia*:

A display based on a photoluminescence quenching device (PQD), the display comprising:

at least one of a hole barrier layer or an electron barrier layer where the hole barrier layer and/or the electron barrier layer are disposed between the emitter layer and one of the first electrode layer and second electrode layer, wherein a highest occupied molecule orbital of the hole barrier layer is energetically lower than a highest occupied molecule orbital of the emitter layer and/or a lowest unoccupied molecule orbital of the electron barrier layer is energetically higher than a lowest unoccupied molecule orbital of the emitter layer,

wherein the lowest unoccupied molecule orbital of the emitter layer corresponds to the lowest unoccupied molecule orbital of the hole barrier layer and/or the highest occupied molecule orbital of the electron barrier layer corresponds to the highest occupied molecule orbital of the emitter layer, whereby the first electrode layer forms a cathode and the second electrode layer forms an anode during re-emissive operation of the display, and the first electrode layer forms the anode and the second electrode layer forms a cathode during emissive operation of the display; or

wherein the lowest unoccupied molecule orbital of the emitter layer is energetically higher than the lowest unoccupied molecule orbital of the hole barrier layer and/or the highest occupied molecule orbital of the electron barrier layer is energetically higher than the highest occupied molecule orbital of the emitter layer, whereby the first electrode layer forms a cathode and the second electrode layer forms an anode during re-emissive operation of the display. (*emphasis added*)

Applicants respectfully submit that Thompson fails to teach or suggest at least such features. Rather, Thompson discloses an organic light emitting device (OLED) including emissive layers, a hole blocking layer that includes at least one metal complex, and an electron blocking layer (See Summary of the Invention, pages 5-10).

Applicants respectfully submit that one of ordinary skill in the art at the time the invention was made would have understood that a PQD and an OLED are not equivalent display devices. First, a PQD device may operate in a re-emissive mode to suppress a photoluminescent emission, while an OLED, as described by Thompson, functions only in an emissive mode. In the re-emissive mode, voltage is applied in an inverse direction compared to the voltage applied in an emissive device such as the OLED. In other words, the second electrode is positively

charged and the first electrode is negatively charged. During the re-emissive mode, excitons are separated into charge carriers by external light before reaching the ground state emitting light; therefore when photons are emitted, the intensity of light is reduced. Therefore, the intensity of the photoluminescent light of a PQD may be controlled by applying voltage in the inverse direction.

Further, during the re-emissive mode, the hole barrier layer and the electron barrier layer recited in claim 1 are distinguishable from the hole blocking layer and the electron blocking layer disclosed in Thompson. In Thompson, the hole *blocking* layer and the electron *blocking* layer block holes or electrons to capture them in the emitter layer. Whereas, the hole *barrier* layer and the electron *barrier* layer facilitate drainage of charge carriers from the emitter layer where the charge carriers are separated from the excitons. Accordingly, one of ordinary skill in the art at the time the invention was made would have understood that the hole barrier layer and the electron barrier layer recited in claim 1 are distinguishable from the hole blocking layer and the electron blocking layer described in Thompson.

Further, claim 1 specifically recites, "wherein the lowest unoccupied molecule orbital of the emitter layer corresponds to the lowest unoccupied molecule orbital of the hole barrier layer and/or the highest occupied molecule orbital of the electron barrier layer corresponds to the highest occupied molecule orbital of the emitter layer". Figure 2 and page 7, lines 19-23 of the specification show that "corresponds" means 'equivalent' or 'equal'. Further, the Merriam-Webster dictionary defines "corresponds" as 'equivalent' or 'match'. On the other hand, Thompson states "Hole blocking layers are also preferably good electron injectors. Accordingly, the LUMO energy level of the HBL is preferably close to the LUMO energy level of the layer in which holes are to be confined" (See page 17, lines 8-10). Thompson further states "Electron blocking layers are also preferably good hole injectors. Accordingly, the HOMO energy level of the EBL is preferably close to the HOMO energy level of the layer in which electrons are to be

confined" (See page 18, lines 10-12). In view of the specification and the Merriam-Webster dictionary, it would be improper to conclude that "close to" means "corresponding" as alleged by the Examiner (See Office Action on pages 3-4, paragraph 13). Further, in view of the distinguishing characteristics described above with respect to the hole and electron barriers layers versus the hole and electron blocking layers, it would be improper to conclude that Thompson discloses the limitations recited in amended claim 1. Accordingly, Thompson fails to teach or suggest each and every claimed feature as recited in amended claim 1.

Claims 13 and 16-19

For reasons similar to those noted above with respect to claim 1, Applicants respectfully submit that Thompson fails to teach or suggest each and every claimed feature of amended claim 13.

Accordingly, Applicants respectfully request withdrawal of the 35 U.S.C. § 102(e) rejection of claims 1 and 13. Claims 8-12 depend from claim 1 and are allowable for at least this reason. Claims 16-19 depend from claim 13 and are allowable for at least this reason. Since none of the other prior art of record discloses or suggests all the features of the claimed invention, Applicants respectfully submit that independent claims 1 and 13, and all the claims that depend therefrom, are allowable.

CONCLUSION

Applicants believe that a full and complete response has been made to the pending Office Action and respectfully submit that all of the stated objections and grounds for rejection have been overcome or rendered moot. Accordingly, Applicants respectfully submit that all pending claims are allowable and that the application is in condition for allowance.

Should the Examiner feel that there are any issues outstanding after consideration of this response, the Examiner is invited to contact Applicants' undersigned representative at the number below to expedite prosecution.

Prompt and favorable consideration of this Reply is respectfully requested.

Respectfully submitted,

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